

Distribution and Ecology of Recent Ostracodes (Crustacea) from Port Hacking, New South Wales

I. YASSINI and A. J. WRIGHT

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INTRODUCTION

Port Hacking is an estuary located about 18km south of the city of Sydney on the central coast of New South Wales (Fig. 1). It is a drowned river valley (Chapman *et al.*, 1982) with a deep water entrance. The estuary was formed by the drowning of the Hacking River valley during the postglacial marine transgression.

Hacking River drains a catchment of Triassic rocks, being located in an incised 11km dendritic valley, and enters the Port Hacking embayment. Ocean waves contribute to the sediment distribution at the mouth of the estuary and up to 5km upstream.

Coarse sandy and silty marine sediments are mainly deposited near the mouth. In the main basin silty sand and mud occur in the shallow tidal flat deposits (Chapman *et al.*, 1982).

Prior to the present work, no published information on the species spectrum and distribution of ostracodes in the estuary was available. The aim of this paper and forthcoming publications is to provide an account of ostracode diversity and distribution in the estuarine and lagoonal environments of the central and southern coasts of New South Wales.

This paper in particular adds to the sparse information available and focuses attention on stratified environments which are at times (see below) oxygen-poor. Contributions covering other environments will further add to our understanding of ostracode ecology. Some data on a major coastal New South Wales lagoon (Lake Illawarra) have been provided by Yassini and Jones (1987).

ENVIRONMENTAL FACTORS

The physical and chemical environmental parameters of Port Hacking have been intensively investigated by the Division of Fisheries and Oceanography of CSIRO for the period 1953 to 1962 (Newell, 1966) and also 1975 (Scott, 1978).

Figure 2 shows the seasonal variation in salinity, temperature and dissolved oxygen at South West Arm Station in 1975 (Scott, 1978, figs 1, 2) where the mid-tide depth was 20m. The mean water surface temperature (Fig. 2a) had an annual variation from 14.8° (July) to 22.5°C (in February). The salinity ranged from less than 30‰ to more than 35‰ (Fig. 2b). During heavy rain periods in March, April and June of 1975 clear

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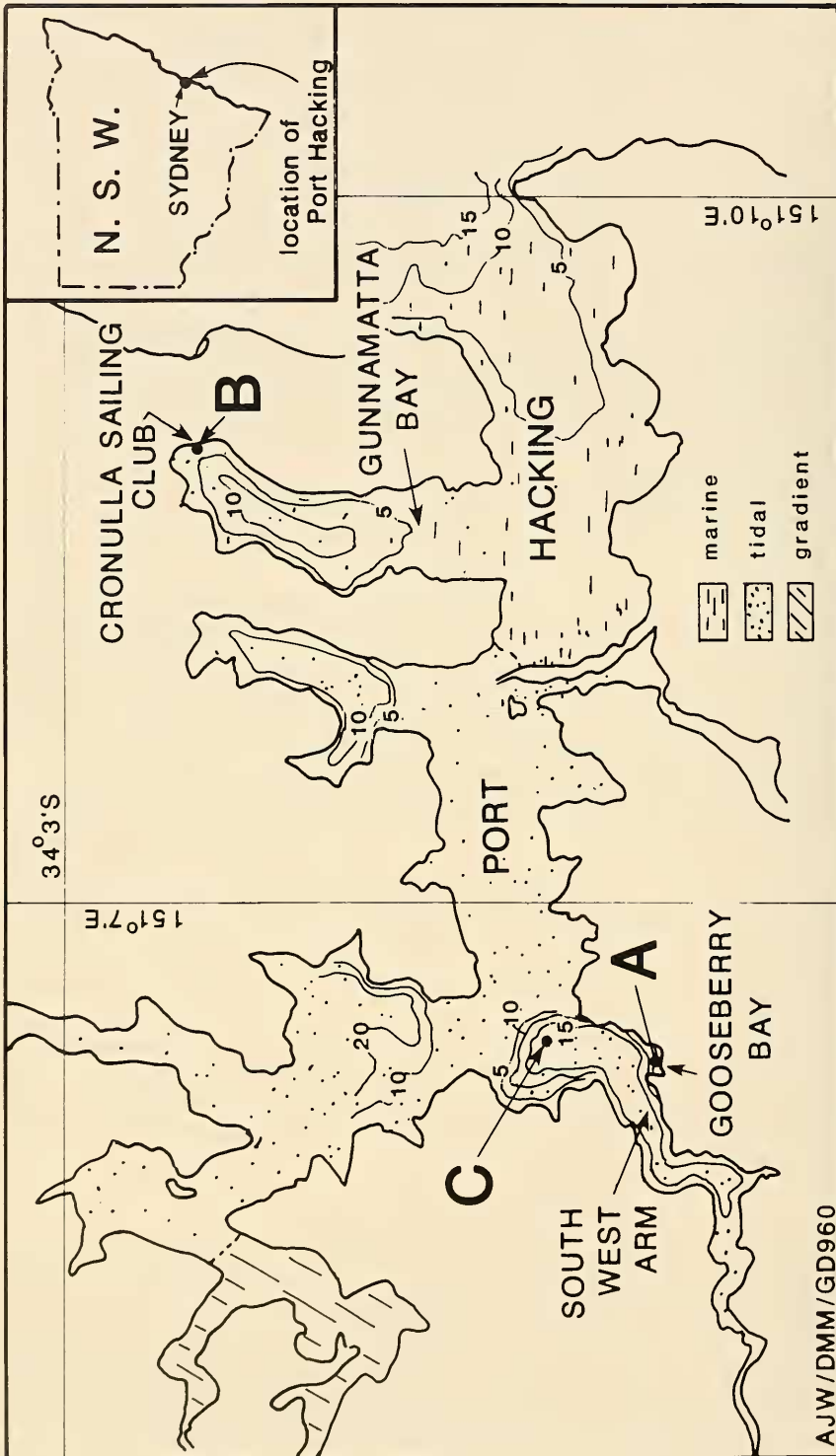


Fig. 1. Locality diagram of Port Hacking, New South Wales. Samples taken from two sections (A and B — see Figs 3 and 4). CSIRO data (see Fig. 2) collected at locality C (Scott, 1978). Depths for some parts only of Port Hacking are given in metres after 1:25,000 Botany Bay and Port Hacking naval map, 1982 (2nd edition). Three zones of circulation (after Rochford, 1951, 1959) are shown, these being (1) marine, (2) tidal and (3) gradient.

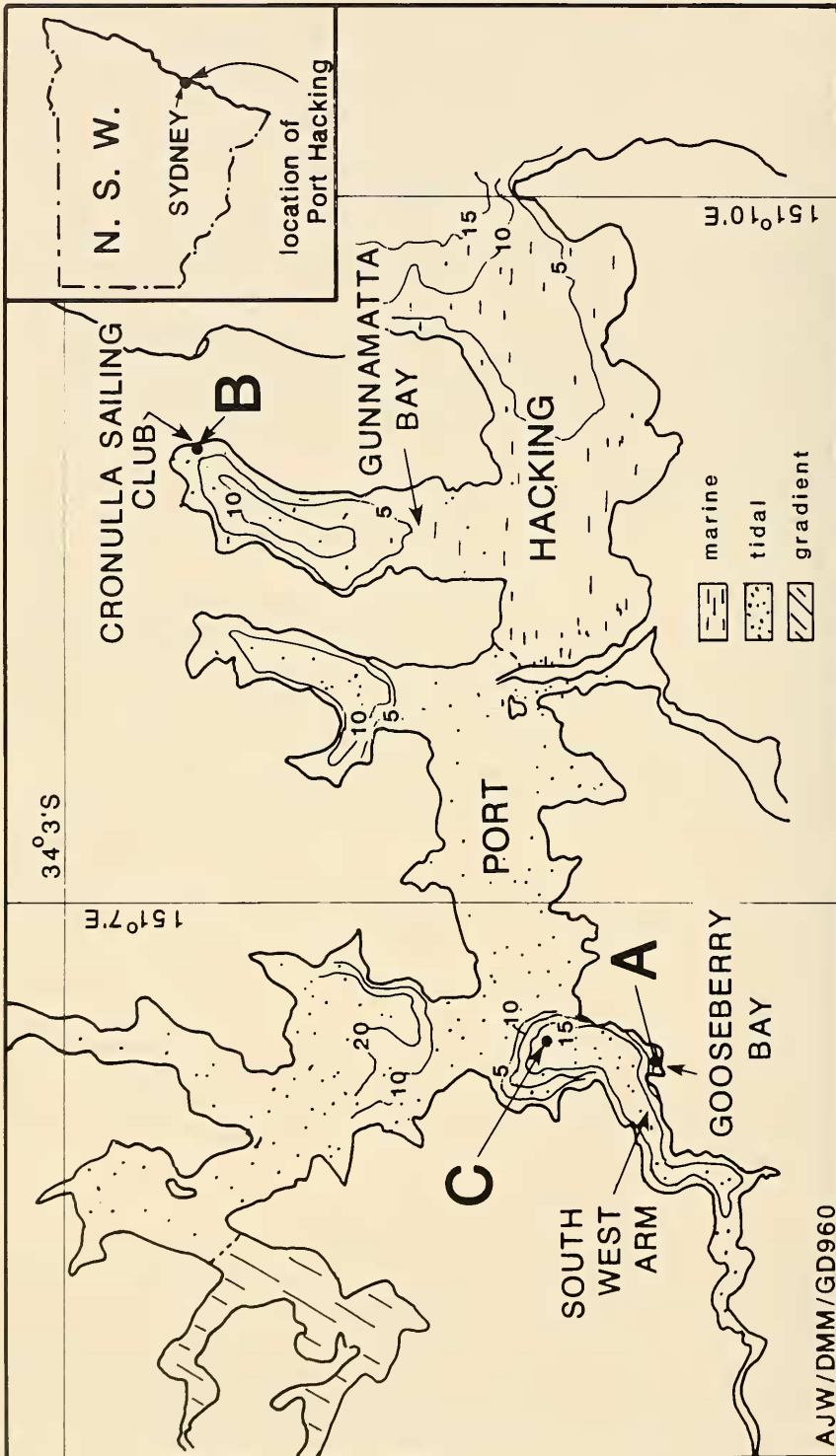


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stratification in salinity was observed in South West Arm. The stratification in the water column during November and December was caused by the temperature difference between the surface and bottom.

The period of stratification was accompanied by deoxygenation of the water column below 10m (Fig. 2c) and in March the dissolved oxygen concentration decreased

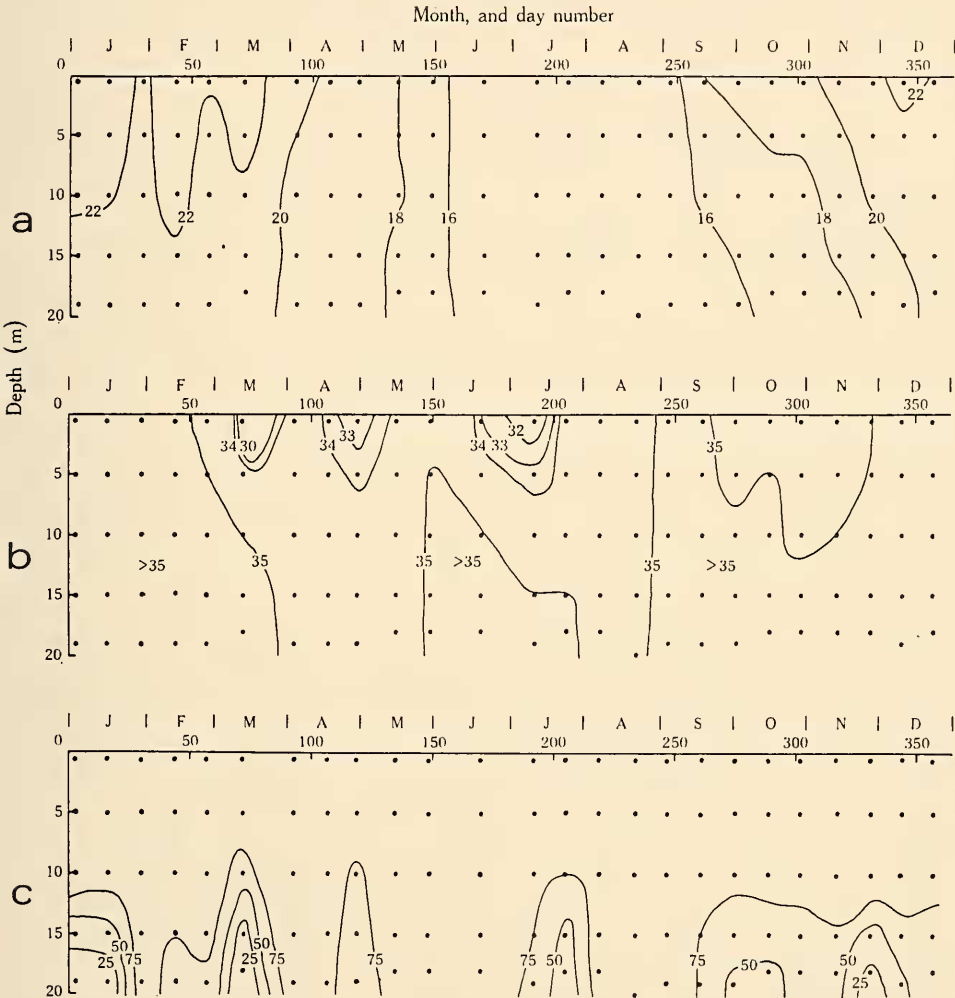


Fig. 2. Seasonal variation in Port Hacking waters, measured at locality C in South West Arm in 1975. (a) temperature ($^{\circ}\text{C}$); (b) salinity ‰ ; and (c) dissolved oxygen (% saturation). All are plotted against depth in metres. Reproduced from Scott (1978) by permission.

to 25% of saturation (Scott, 1978). The phenomenon of temporary deoxygenation of the water in Port Hacking is also discussed by Godfrey and Parslow (1976). Rochford (1951, 1959) subdivided the estuary, on the basis of tidally controlled salinity changes, into three zones — marine, tidal and gradient (see Fig. 1).

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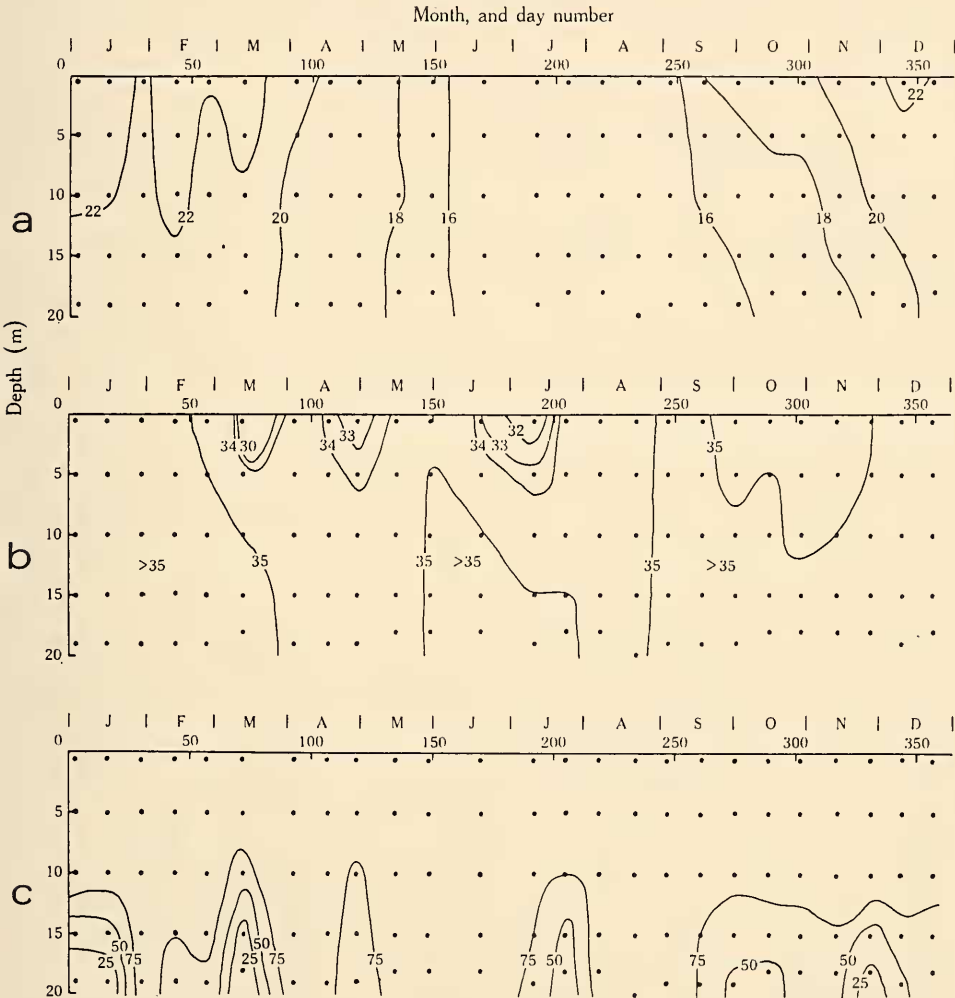


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METHODS AND MATERIAL

Samples were collected by SCUBA divers from South West Arm (tidal zone) from 2 to 10m depth (Fig. 3) and from 2 to 3m depth at the Cronulla Sailing Club, (*Posidonia* beds, Gunnamatta Bay marine zone) (Fig. 4). 500cc of fresh samples were sieved the same day and the residue dried in the oven. 50cc of the residue were treated with carbon tetrachloride. Counts of the number of ostracodes were based on both articulated and single valves. When found disarticulated, live specimens were identified by the presence of appendages inside the valve.

OSTRACODE FAUNAL ASSEMBLAGES

Figures 3 and 4 list the assemblages and give the proportions of dead and live shells in the ostracode populations encountered in South West Arm and Gunnamatta Bay respectively.

South West Arm lies in the tidal zone and Gunnamatta Bay in the marine zone (Fig. 1). This is reflected in the faunas, as there are 30 species recorded here from Gunnamatta Bay and 21 from South West Arm, of which 18 species are shared. Major differences in the assemblages can be seen (Figs 3, 4), in composition as well as diversity. In the tidal South West Arm (Fig. 3), *Hiltermannicythere* *bassiounii* Hartmann and *Loxoconcha australis* Brady are dominant, constituting 41% of the assemblages. The Gunnamatta Bay (Fig. 4) marine assemblage is dominated by three taxa constituting 53% of the assemblage; these are *Paracytheroma sudaustralis* (McKenzie), *Osticythere baragwanathi* (Chapman and Crespin), and *Callistocythere dorsotuberculata paucicostata* Yassini and Jones. *H. bassiounii* is represented by only a few isolated valves in Gunnamatta Bay despite its dominance (43-45%) in South West Arm. *O. baragwanathi* is present in both localities but the proportion of living specimens is much higher in South West Arm.

O. baragwanathi and *P. sudaustralis* are typical inhabitants of coastal barrier lagoons, where the salinity is highly fluctuating, and deoxygenation at the sediment-water interface often occurs as a result of salinity stratification, especially as a result of major flooding (State Pollution Control Commission (N.S.W.), 1983; Gibbs, 1986). In Lake Illawarra, where the average salinity range is 15-47‰, these two species constitute 92% of the ostracode fauna on the muddy substrate of the lake. Elsewhere in New South Wales, other coastal lagoons possess these species. In Narrabeen Lagoon, as well as Brisbane Water, *O. baragwanathi* is the most abundant faunal element in muddy substrates. In Tuggerah Lake, *O. baragwanathi* and *P. sudaustralis* are the predominant ostracode species. In Lake Macquarie an assemblage of *O. baragwanathi*, *Pectocythere portjacksonensis*, *P. sudaustralis* and *Hemicytheridea hiltoni* forms 90% of the ostracode fauna in muddy substrates. By contrast, in open bays such as Jervis Bay and Twofold Bay, and estuaries with large ocean exchanges (Hawkesbury River), these species are absent or quite subordinate.

Comparison of the ostracode fauna of Port Hacking with those of other estuaries indicates that it is intermediate between a typical lagoon fauna and that known from open bays or drowned valley estuaries such as Jervis Bay and Broken Bay.

In summary, a total of 33 species belonging to 23 genera are identified in the studied materials for both faunas. Two new species, *Hemicytheridea hiltoni* and *Semicytherura illeri* are described. A short synonymy list with most recent references is given for the other species. Two species listed in Fig. 4 (*Callistocythere* sp. nov. and *Loxoconcha* sp. nov.) are not illustrated herein or mentioned in the text, as they are rare and will be described on the basis of abundant material from Botany Bay, a few kilometres to the north of Port Hacking. Equally, rare material referred to *Bairdoppilata* sp. (Fig. 4) is

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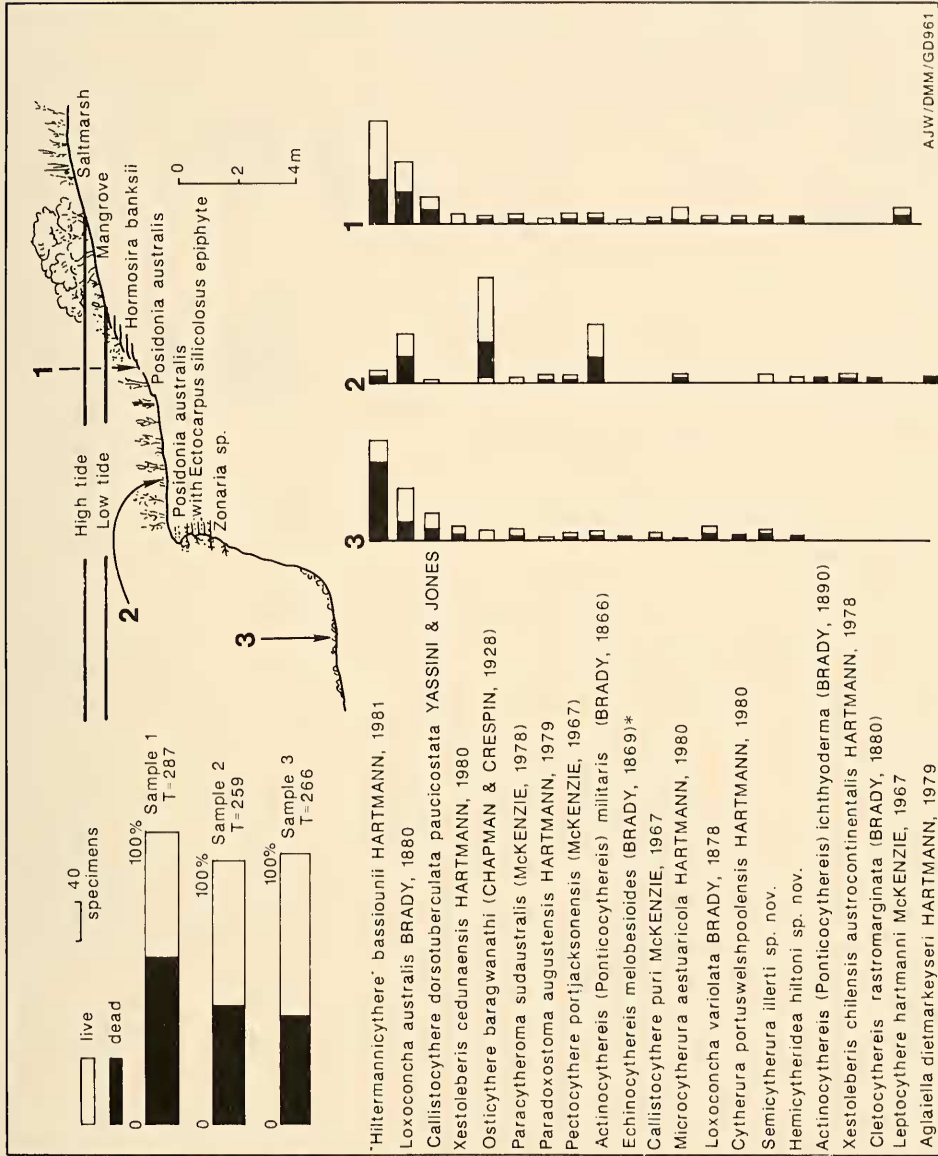
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Fig. 3. Distribution of ostracodes in tidal zone in South West Arm, Port Hacking (locality A of Fig. 1). T is total number of individuals per 50cc of washed residue. Proportion of dead specimens in sample 1 (T = 287) is 58%; in sample 2 (T = 259) is 45%; and in sample 3 (T = 266) is 40%. Near-shore profile showing associated flora gives location of samples. In top left of diagram, proportion of dead specimens is shown in black. Asterisk indicates juvenile specimens.



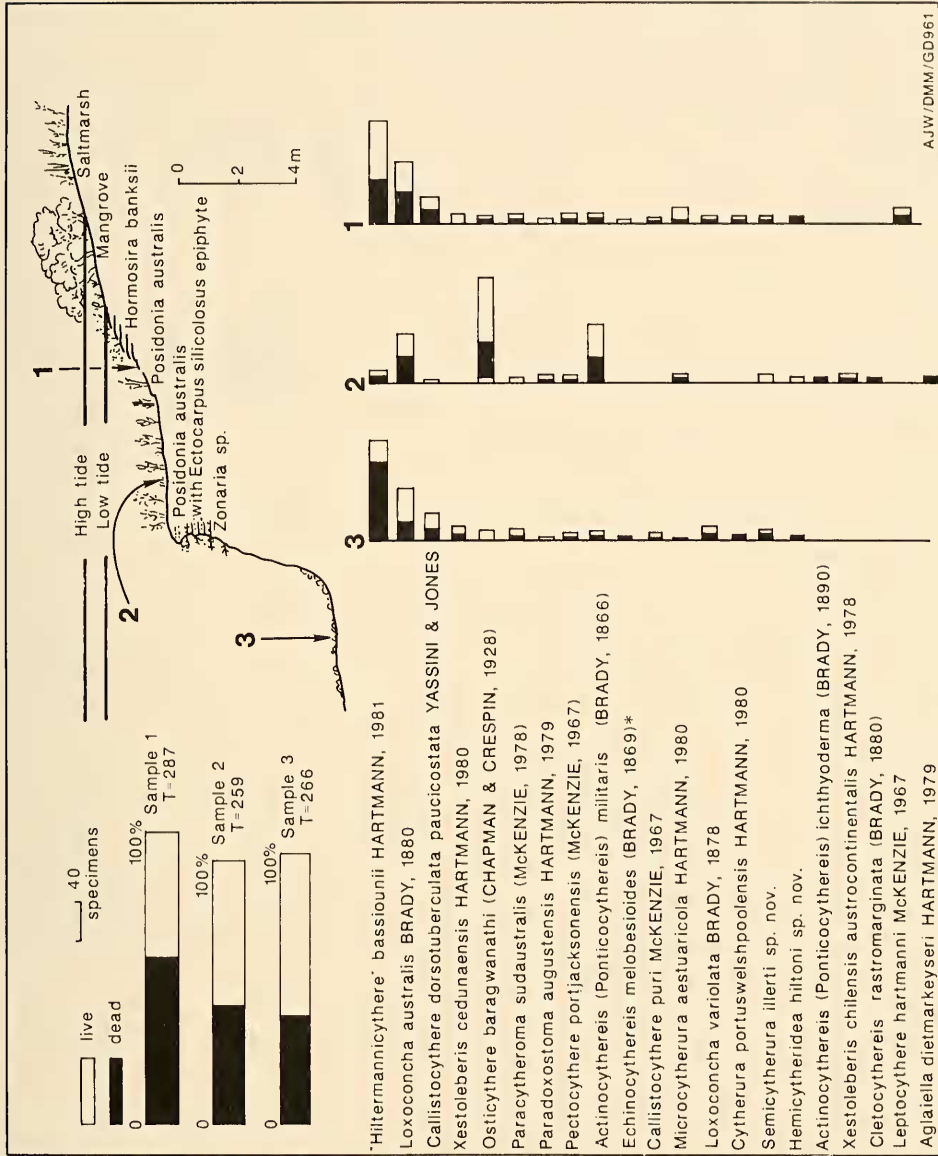


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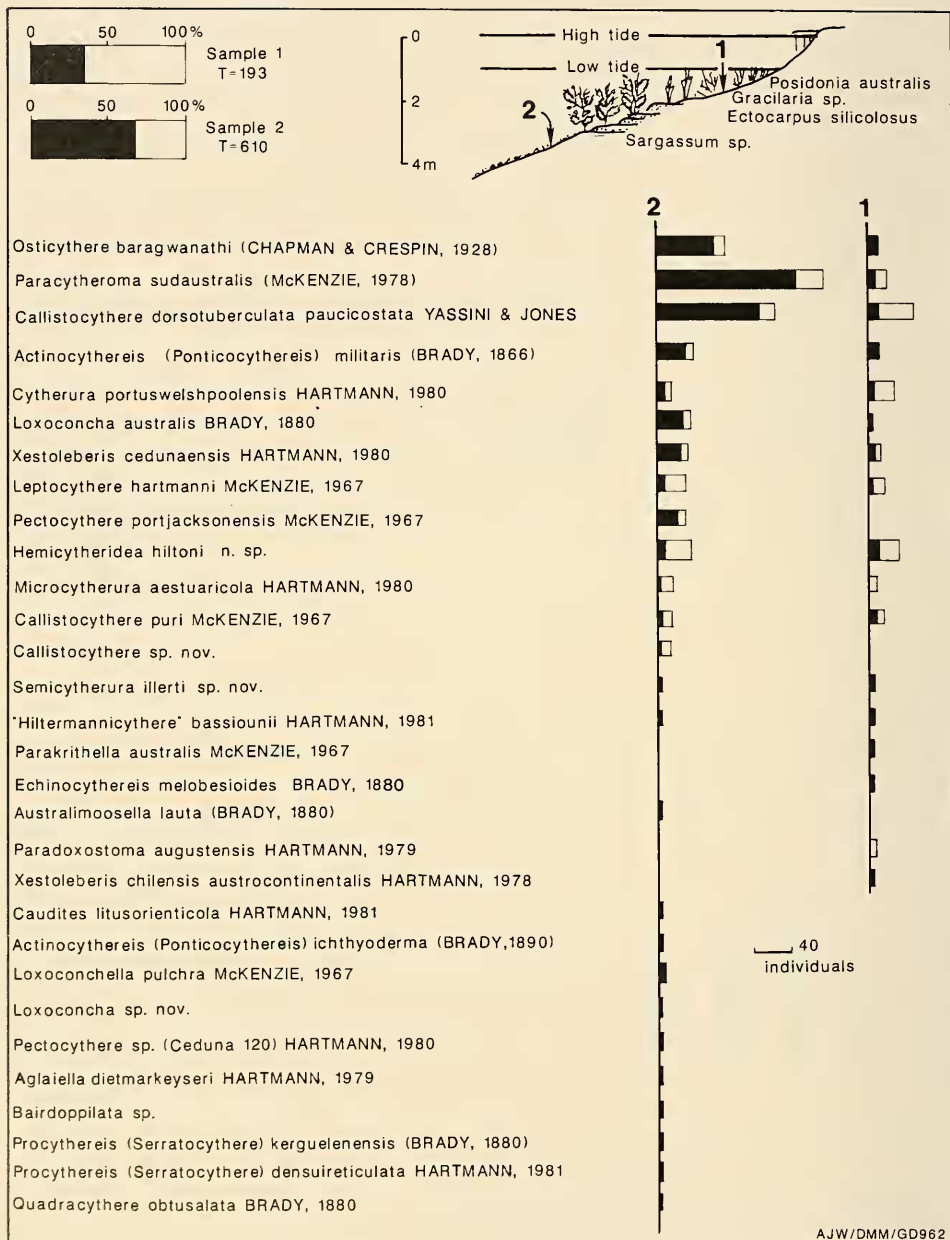


Fig. 4. Distribution of ostracodes in profile off jetty at Cronulla Sailing Club, Gunnamatta Bay (locality B of Fig. 1), in marine zone of circulation. T is total number of individuals per 50cc of washed residue. Proportion of dead specimens in sample 1 is 35% (T = 193) and in sample 2 is 67% (T = 610). Nearshore profile showing associated floras gives location of samples. In top left of diagram, proportion of dead specimens is shown in black.

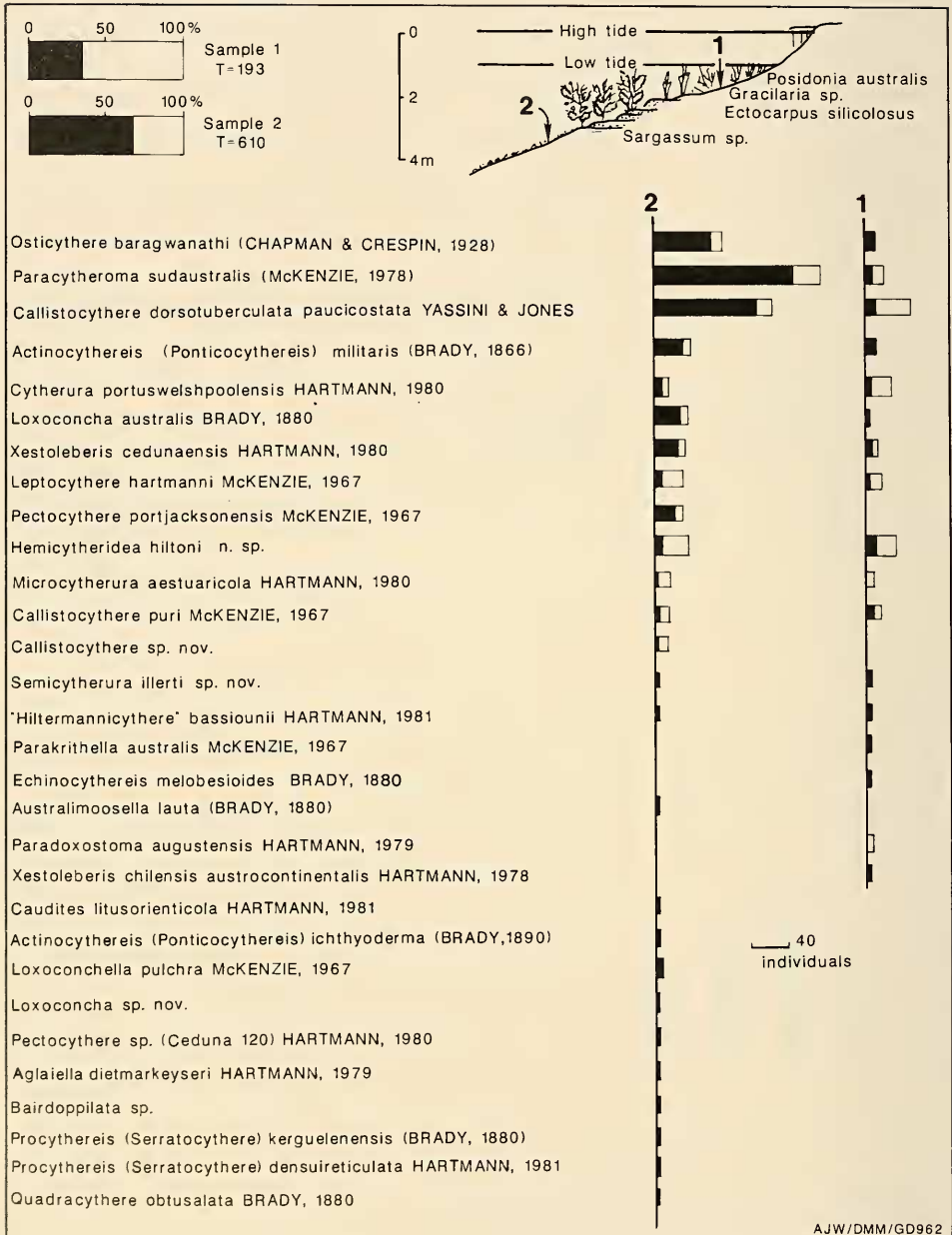


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SYSTEMATICS

Suborder PLATYCOPIDA

Family BAIRDIIDAE Brady, 1883

Genus *Bairdoppilata* Corywell, Sample and Jennings, 1935*Bairdoppilata* sp.

(AM P36478)

Only two isolated valves of this form were encountered in Gunnamatta Bay and are not illustrated.

Family CYTHERIDAE Baird, 1850

Genus *Microcytherura* Müller, 1894*Microcytherura aestuaricola* Hartmann

(Fig. 5G-I) (AM P36493)

1980 *Microcytherura aestuaricola* Hartmann, p.117, pl.3, figs 7-13

Family OSTICYTHERIDAE Hartmann, 1980

Genus *Osticythere* Hartmann, 1980*Osticythere baragwanathi* (Chapman and Crespin)

(Fig. 5M,N) (AM P36494)

1928 *Cythere baragwanathi* Chapman and Crespin, p.126, pl.10, fig. 65a,b1980 *Osticythere reticulata* Hartmann, p.119, pl.4, fig. 7-181984 *Osticythere reticulata* Hartmann; McKenzie and Pickett, p.236, fig. 4, R-U1986 *Osticythere baragwanathi* (Chapman and Crespin); McKenzie, p.107

Family LEPTOCYTHERIDAE Hanai, 1957

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(Fig. 7K,L) (AM P36489)

1967 *Callistocythere hartmanni* McKenzie, p.81, pl.12, fig. 51978 *Leptocythere hartmanni* (McKenzie); Hartmann, p.79, figs 101-1071980 *Leptocythere hartmanni* (McKenzie); Hartmann, p.123, pl.5, figs 15,16,18,191984 *Callistocythere hartmanni* McKenzie; McKenzie and Pickett, p.239, fig. 5YGenus *Callistocythere* Ruggieri, 1953*Callistocythere dorsotuberculata paucicostata* Yassini and Jones

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1987 *Callistocythere dorsotuberculata paucicostata* Yassini and Jones, p.27, pl.2, figs 3-4

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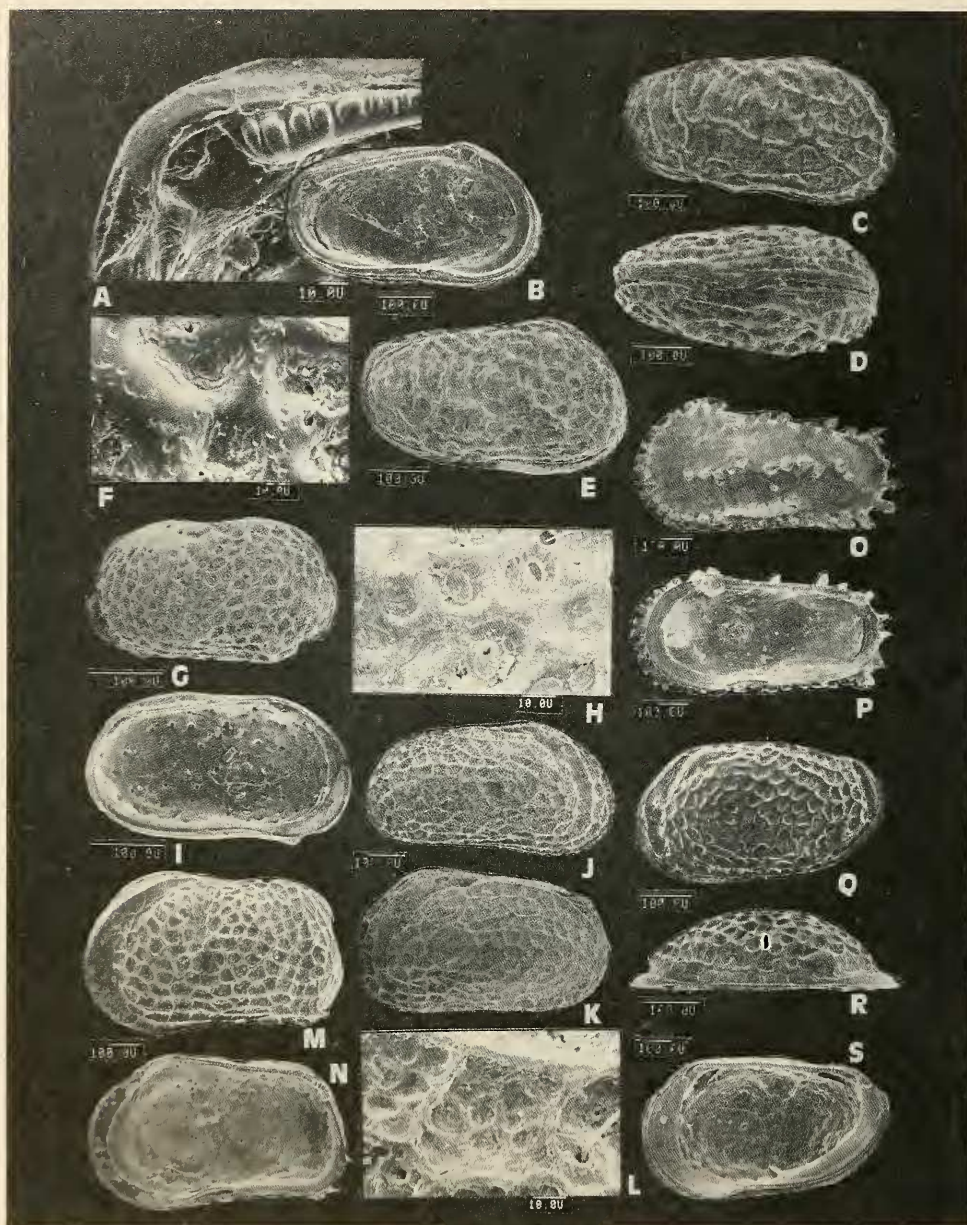


Fig. 5. A-F, *Hemicytheridea hiltoni* Yassini sp. nov. A, LV with details of posterior hinge teeth and sockets; B, LV internal view; C, RV external view, *holotype*; D, Ventral view of carapace; E, RV external view; F, Details of ornamentation. Sample 2, Port Hacking, Gunnamatta Bay. G-I, *Microcytherura aestuaricola* Hartmann, 1980. G, LV external view; H, Details of ornamentation; I, LV internal view. Sample 2, Port Hacking, South West Arm. J-L, *'Hiltermannicythere' bassiounii* Hartmann, 1981. J, RV external view; K (same scale as J), LV external view; L, Details of ornamentation. Sample 2, Port Hacking, South West Arm. M, N, *Osticythere baragwanathi* (Chapman and Crespin, 1928). M, LV external view; N, RV internal view. Sample 3, Port Hacking, South West Arm. O, P, *Actinocythereis (Ponticythereis) militaris* (Brady, 1866). O, LV external view; P, internal view. Sample 3, Port Hacking, South West Arm. Q-S, *Loxoconcha variolata* Brady, 1878. Q, LV external view; R, LV dorsal view; S, RV internal view. Sample 1, Port Hacking, South West Arm.

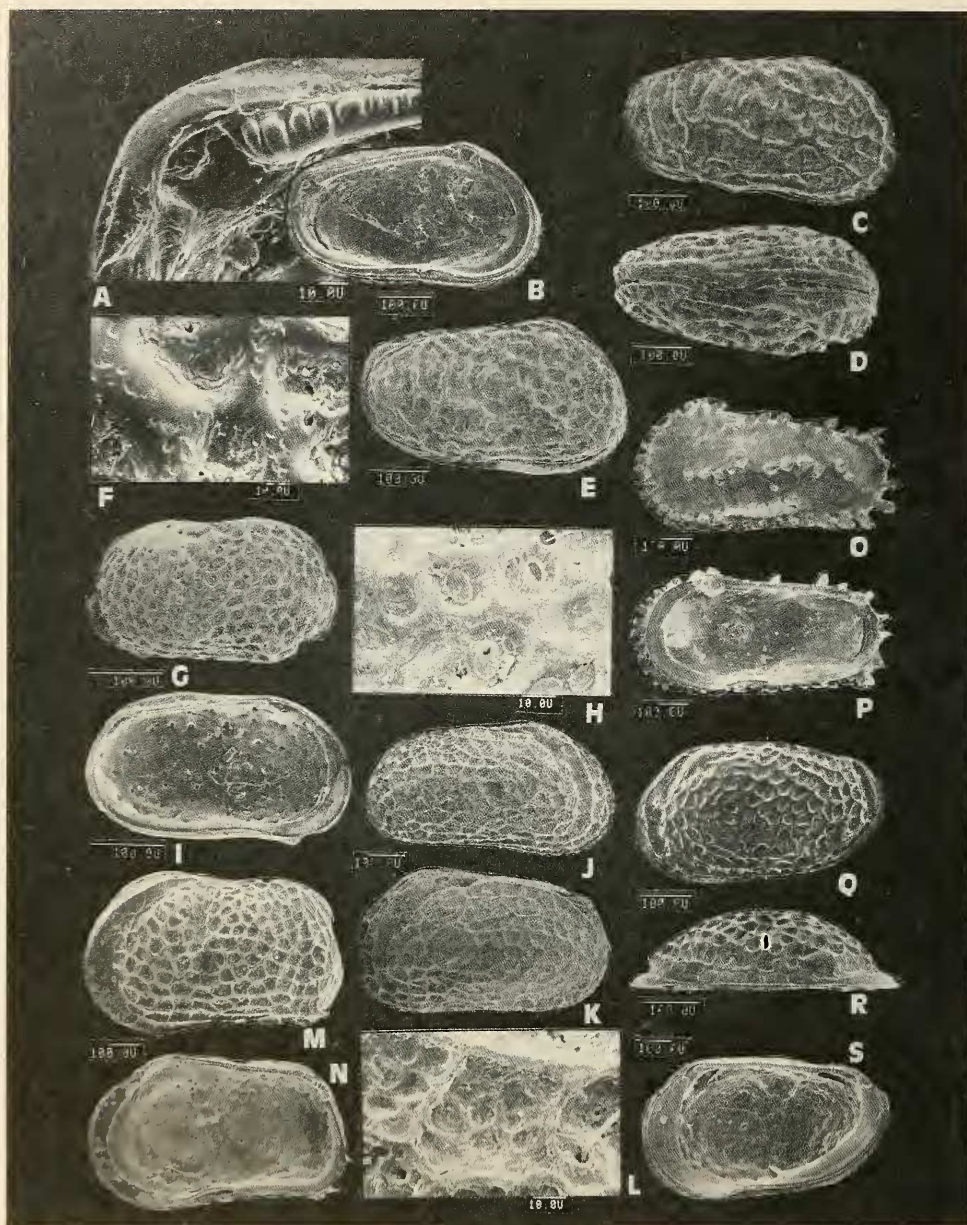


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Callistocythere puri McKenzie
(Fig. 7O) (AM P36480)

- 1967 *Callistocythere puri* McKenzie, p.81, pl.12, fig. 2; text-fig. 32
1980 *Callistocythere puri* McKenzie; Hartmann, p.124, pl.7, figs 3,6

Family CYTHEROMIDAE Elofson, 1939
Genus *Paracytheroma* Juday, 1907

Paracytheroma sudaustralis (McKenzie)
(Fig. 7C,D) (AM P36495)

- 1978 *Cytheroma sudaustralis* McKenzie, p.178, figs 30,35-42
1980 *Paracytheroma sudaustralis* (McKenzie); Hartmann, p.128, figs 51-56

Genus *Parakrithella* Hanai, 1959

Parakrithella australis McKenzie
(Fig. 7G) (AM P36497)

- 1967 *Parakrithella australis* McKenzie, p.72, pl.26 fig. N-O
1980 *Parakrithella* cf. *australis* McKenzie; Hartmann, p.129
1984 *Parakrithella australis* McKenzie; McKenzie and Pickett, p.236, fig. 4G-H

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
Genus *Actinocythereis* Puri, 1953
Subgenus *Ponticythereis* McKenzie, 1967

Actinocythereis (*Ponticythereis*) *militaris* (Brady)
(Fig. 5O,P) (AM P36476)

- 1866 *Cythereis militaris* Brady, p.385, pl.61, fig. 9a-d
1880 *Cythere clavigera* Brady, p.111, pl.23, fig. 7a-d
1967 *Ponticythereis militaris* (Brady); McKenzie, p.96, pl.3, fig. 4, text-figs 40 and 10c-d
1976 *Cythere clavigera* Brady; Puri and Hulings, p.270, pl.16, figs 1,2, text-fig. 4
1984 *Ponticythereis militaris* (Brady); McKenzie and Pickett, p.239, fig. 5B

Actinocythereis (*Ponticythereis*) *ichthyoderma* Brady
(Fig. 6E,F) (AM P36483)

- 1890 *Cythere ichthyoderma* Brady, p.503, pl.2, figs 22,23
1986 *Ponticythereis quadriserialis* Brady; McKenzie, p.98, pl.2, fig. 13

Genus *Australimoosella* Hartmann, 1978

Australimoosella lauta (Brady)

- 1880 *Cythere lauta* Brady, p.88, pl.21, fig. 4a-d
1976 *Cythere lauta* Brady; Puri and Hulings, p.280, pl.4, figs 5-8

Genus *Hiltermannicythere* Bassiouni, 1970

Hiltermannicythere *bassiounii* Hartmann
(Fig. 5J-L) (AM P36488)

- 1978 *Hiltermannicythere bassiounii* Hartmann, p.91, pl.7, figs 6-14
1979 *Hiltermannicythere bassiounii*; Hartmann, p.232, pl.5, figs 10-20
1980 *Hiltermannicythere bassiounii*; Hartmann, p.131, pl.9, figs 8-11, 13-14

Callistocythere puri McKenzie
(Fig. 7O) (AM P36480)

- 1967 *Callistocythere puri* McKenzie, p.81, pl.12, fig. 2; text-fig. 32
1980 *Callistocythere puri* McKenzie; Hartmann, p.124, pl.7, figs 3,6

Family CYTHEROMIDAE Elofson, 1939
Genus *Paracytheroma* Juday, 1907

Paracytheroma sudaustralis (McKenzie)
(Fig. 7C,D) (AM P36495)

- 1978 *Cytheroma sudaustralis* McKenzie, p.178, figs 30,35-42
1980 *Paracytheroma sudaustralis* (McKenzie); Hartmann, p.128, figs 51-56

Genus *Parakrithella* Hanai, 1959

Parakrithella australis McKenzie
(Fig. 7G) (AM P36497)

- 1967 *Parakrithella australis* McKenzie, p.72, pl.26 fig. N-O
1980 *Parakrithella* cf. *australis* McKenzie; Hartmann, p.129
1984 *Parakrithella australis* McKenzie; McKenzie and Pickett, p.236, fig. 4G-H

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
Genus *Actinocythereis* Puri, 1953
Subgenus *Ponticythereis* McKenzie, 1967

Actinocythereis (*Ponticythereis*) *militaris* (Brady)
(Fig. 5O,P) (AM P36476)

- 1866 *Cythereis militaris* Brady, p.385, pl.61, fig. 9a-d
1880 *Cythere clavigera* Brady, p.111, pl.23, fig. 7a-d
1967 *Ponticythereis militaris* (Brady); McKenzie, p.96, pl.3, fig. 4, text-figs 40 and 10c-d
1976 *Cythere clavigera* Brady; Puri and Hulings, p.270, pl.16, figs 1,2, text-fig. 4
1984 *Ponticythereis militaris* (Brady); McKenzie and Pickett, p.239, fig. 5B

Actinocythereis (*Ponticythereis*) *ichthyoderma* Brady
(Fig. 6E,F) (AM P36483)

- 1890 *Cythere ichthyoderma* Brady, p.503, pl.2, figs 22,23
1986 *Ponticythereis quadriserialis* Brady; McKenzie, p.98, pl.2, fig. 13

Genus *Australimoosella* Hartmann, 1978

Australimoosella lauta (Brady)

- 1880 *Cythere lauta* Brady, p.88, pl.21, fig. 4a-d
1976 *Cythere lauta* Brady; Puri and Hulings, p.280, pl.4, figs 5-8

Genus *Hiltermannicythere* Bassiouni, 1970

Hiltermannicythere *bassiounii* Hartmann
(Fig. 5J-L) (AM P36488)

- 1978 *Hiltermannicythere bassiounii* Hartmann, p.91, pl.7, figs 6-14
1979 *Hiltermannicythere bassiounii*; Hartmann, p.232, pl.5, figs 10-20
1980 *Hiltermannicythere bassiounii*; Hartmann, p.131, pl.9, figs 8-11, 13-14

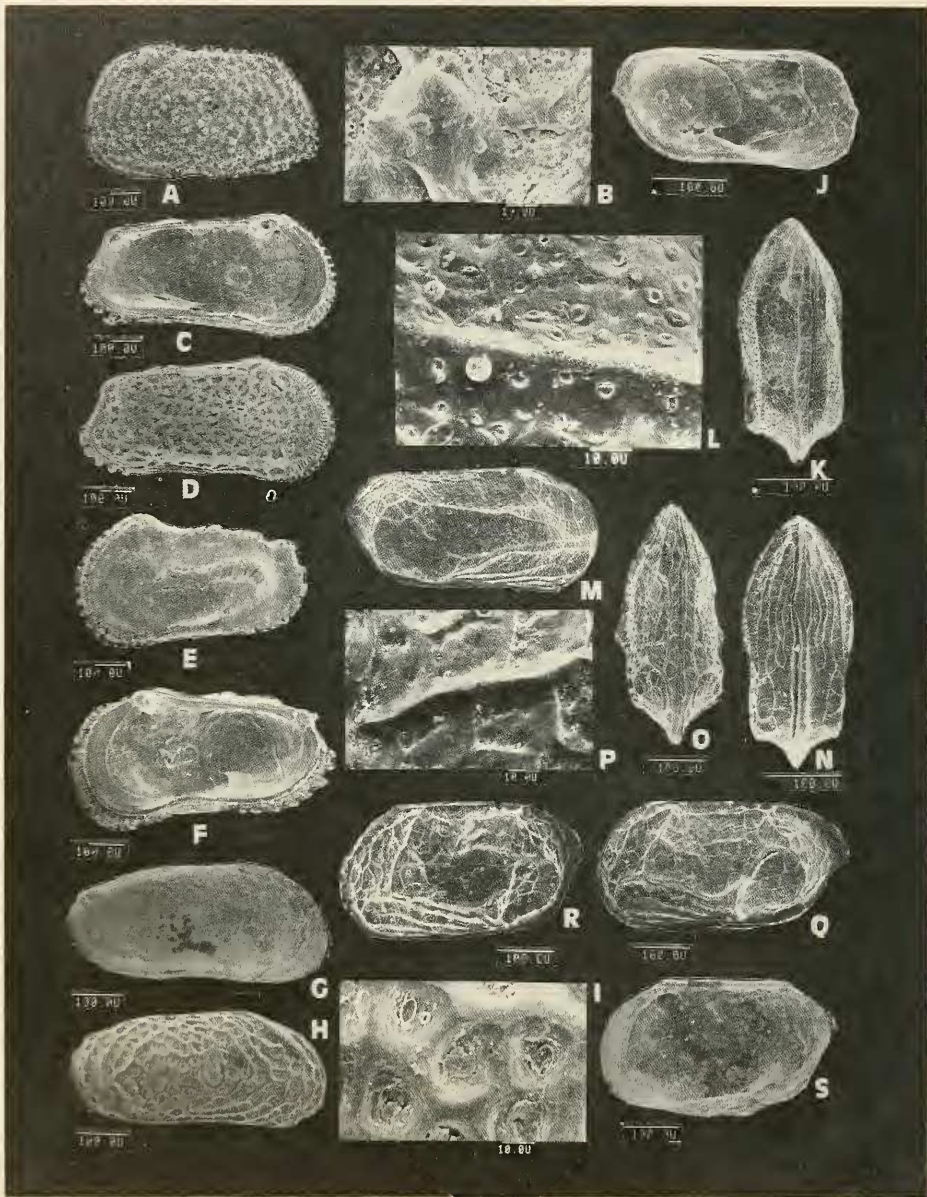


Fig. 6. A, B, *Echinocythereis melobesioides* (Brady, 1880). A, LV external view; B, details of ornamentation. Sample 3, Port Hacking, South West Arm. C, D, *Cletocythereis rastromarginata* (Brady, 1880). C, LV internal view; D, RV external view. Sample 2, Port Hacking, South West Arm. E, F, *Actinocythereis* (*Ponticythereis*) *ichthyoderma* (Brady, 1890). E, LV external view; F, RV internal view. Sample 2, Port Hacking, Gunnamatta Bay. G-I, *Pectocythere portjacksonensis* (McKenzie, 1967). G, LV internal view; H, RV external view; I, details of ornamentation. Sample 2, Port Hacking, Gunnamatta Bay. J-N, *Semicytherura illerti* Yassini n.sp. J, LV internal view; K, dorsal view of carapace; L, details of ornamentation, *holotype*; M, RV external view, *holotype*; N (same scale as M), ventral view of carapace. Sample 1, Port Hacking, South West Arm. O-S, *Cytherura portuswelshpoolensis* Hartmann, 1980. O, dorsal view of carapace; P, details of ornamentation; Q, LV external view; R, LV external view; S, RV internal view. Sample 1, Port Hacking, Gunnamatta Bay.

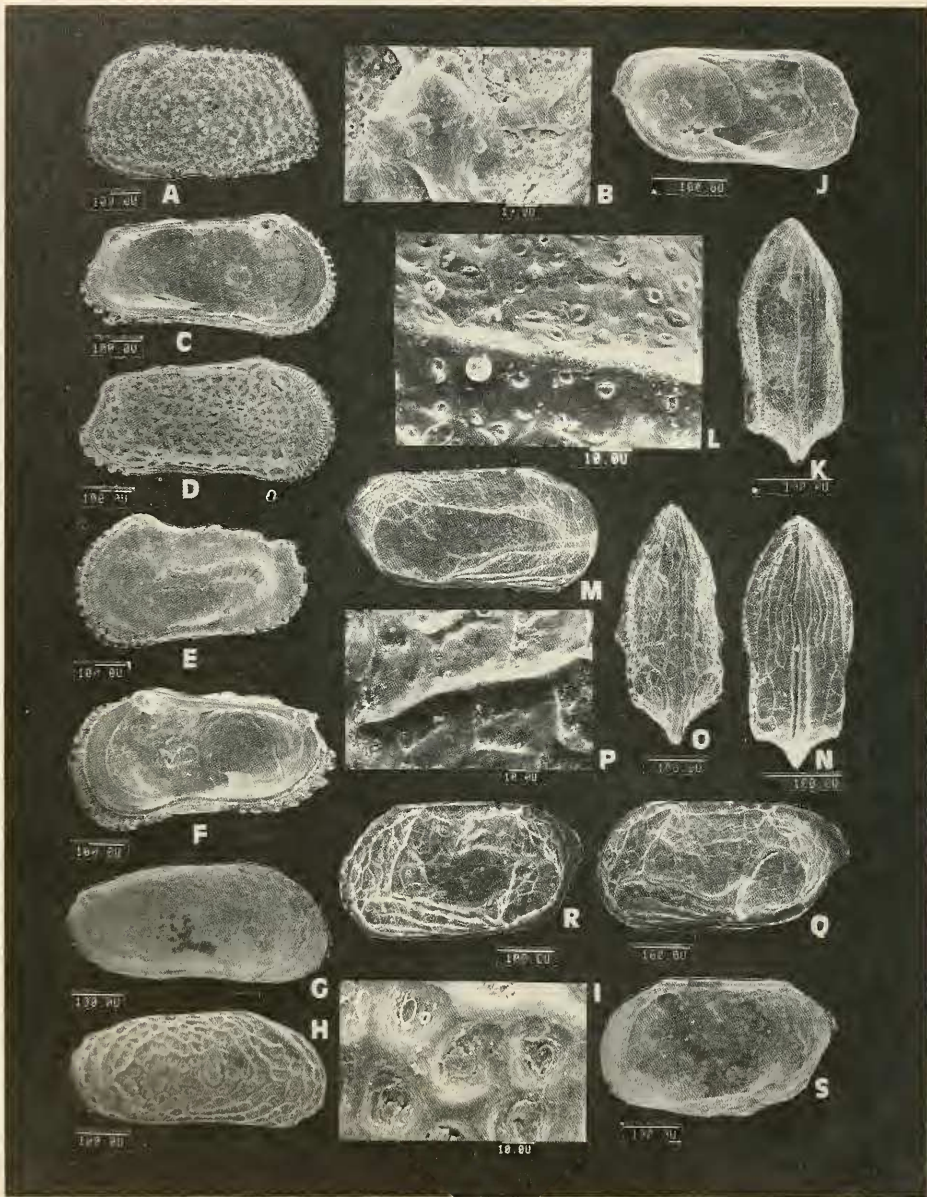


Fig. 6. A, B, *Echinocythereis melobesioides* (Brady, 1880). A, LV external view; B, details of ornamentation. Sample 3, Port Hacking, South West Arm. C, D, *Cletocythereis rastromarginata* (Brady, 1880). C, LV internal view; D, RV external view. Sample 2, Port Hacking, South West Arm. E, F, *Actinocythereis* (*Ponticythereis*) *ichthyoderma* (Brady, 1890). E, LV external view; F, RV internal view. Sample 2, Port Hacking, Gunnamatta Bay. G-I, *Pectocythere portjacksonensis* (McKenzie, 1967). G, LV internal view; H, RV external view; I, details of ornamentation. Sample 2, Port Hacking, Gunnamatta Bay. J-N, *Semicytherura illerti* Yassini n.sp. J, LV internal view; K, dorsal view of carapace; L, details of ornamentation, *holotype*; M, RV external view, *holotype*; N (same scale as M), ventral view of carapace. Sample 1, Port Hacking, South West Arm. O-S, *Cytherura portuswelshpoolensis* Hartmann, 1980. O, dorsal view of carapace; P, details of ornamentation; Q, LV external view; R, LV external view; S, RV internal view. Sample 1, Port Hacking, Gunnamatta Bay.

Genus *Echinocythereis* Puri, 1953*Echinocythereis melobesioides* (Brady)

(Fig. 6A,B) (AM P36485)

1880 *Cythere melobesioides* Brady, p.108, pl.18, fig. 1a-g1976 *Cythere melobesioides* Brady; Puri and Hulings, pl.25, figs 1-2

Family HEMICYTHERIDAE Puri, 1953

Genus *Cletocythereis* Swain, 1963*Cletocythereis rastromarginata* (Brady)

(Fig. 6C-D) (AM P36482)

1880 *Cythere rastromarginata* Brady, p.83, pl.16, fig. 1a-d1967 *Cletocythereis rastromarginata* (Brady); McKenzie, p.95, pl.13, figs 1-21979 *Cletocythereis* cf. *rastromarginata* (Brady): Hartmann, p.234, pl.6, figs 5-71984 *Cletocythereis rastromarginata* (Brady); McKenzie and Pickett, p.239, fig. 5C-DGenus *Quadricythere* Hornibrook, 1952*Quadricythere obtusalata* (Brady, 1880)1880 *Cythere obtusalata* Brady, p.91, pl.12, fig. 1a-c1976 *Cythere obtusalata* Brady; Puri and Hulings, p.282, pl.5, figs 10-12Genus *Procythereis* Skogsberg, 1928Subgenus *Serratocythere* Hartmann, 1979*Procythereis* (*Serratocythere*) *densuireticulata* Hartmann

(AM P36500)

1981 *Procythereis* (*Serratocythere*) *densuireticulata* Hartmann, p.110, pl.7, figs 3-91982 *Procythereis* (*Serratocythere*) *lyttletonensis* Hartmann, p.131, pl.5, figs 6-11*Procythereis* (*Serratocythere*) *kerquelenensis* (Brady)

(AM P36501)

1880 *Cythere kerquelenensis* Brady, p.78-79, pl.4, figs 16-18; pl.20, fig. 1a-f1974 '*Hemicythere*' *kerquelenensis* (Brady); McKenzie, p.160, pl.1, fig. 91981 *Procythereis* (*Serratocythere*) *australis* Hartmann, p.110, pl.7, figs 1-2Genus *Caudites* Coryell and Fields, 1937*Caudites litusorienticola* Hartmann

(Fig. 7H) (AM P36481)

1981 *Caudites litusorienticola* Hartmann, p.111, pl.7, figs 10-13

Family LOXOCONCHIDAE Sars, 1925

Genus *Loxoconcha* Sars, 1868*Loxoconcha australis* Brady

(Fig. 7P) (AM P36490)

1880 *Loxoconcha australis* Brady, p.119, pl.28, fig. 3a-d, fig. 5a-f1967 *Loxoconcha australis* Brady; McKenzie, p.86, pl.12, figs 10-11, fig. 3n-o

Genus *Echinocythereis* Puri, 1953*Echinocythereis melobesioides* (Brady)

(Fig. 6A,B) (AM P36485)

1880 *Cythere melobesioides* Brady, p.108, pl.18, fig. 1a-g1976 *Cythere melobesioides* Brady; Puri and Hulings, pl.25, figs 1-2

Family HEMICYTHERIDAE Puri, 1953

Genus *Cletocythereis* Swain, 1963*Cletocythereis rastromarginata* (Brady)

(Fig. 6C-D) (AM P36482)

1880 *Cythere rastromarginata* Brady, p.83, pl.16, fig. 1a-d1967 *Cletocythereis rastromarginata* (Brady); McKenzie, p.95, pl.13, figs 1-21979 *Cletocythereis* cf. *rastromarginata* (Brady): Hartmann, p.234, pl.6, figs 5-71984 *Cletocythereis rastromarginata* (Brady); McKenzie and Pickett, p.239, fig. 5C-DGenus *Quadricythere* Hornibrook, 1952*Quadricythere obtusalata* (Brady, 1880)1880 *Cythere obtusalata* Brady, p.91, pl.12, fig. 1a-c1976 *Cythere obtusalata* Brady; Puri and Hulings, p.282, pl.5, figs 10-12Genus *Procythereis* Skogsberg, 1928Subgenus *Serratocythere* Hartmann, 1979*Procythereis* (*Serratocythere*) *densuireticulata* Hartmann

(AM P36500)

1981 *Procythereis* (*Serratocythere*) *densuireticulata* Hartmann, p.110, pl.7, figs 3-91982 *Procythereis* (*Serratocythere*) *lyttletonensis* Hartmann, p.131, pl.5, figs 6-11*Procythereis* (*Serratocythere*) *kerquelenensis* (Brady)

(AM P36501)

1880 *Cythere kerquelenensis* Brady, p.78-79, pl.4, figs 16-18; pl.20, fig. 1a-f1974 '*Hemicythere*' *kerquelenensis* (Brady); McKenzie, p.160, pl.1, fig. 91981 *Procythereis* (*Serratocythere*) *australis* Hartmann, p.110, pl.7, figs 1-2Genus *Caudites* Coryell and Fields, 1937*Caudites litusorienticola* Hartmann

(Fig. 7H) (AM P36481)

1981 *Caudites litusorienticola* Hartmann, p.111, pl.7, figs 10-13

Family LOXOCONCHIDAE Sars, 1925

Genus *Loxoconcha* Sars, 1868*Loxoconcha australis* Brady

(Fig. 7P) (AM P36490)

1880 *Loxoconcha australis* Brady, p.119, pl.28, fig. 3a-d, fig. 5a-f1967 *Loxoconcha australis* Brady; McKenzie, p.86, pl.12, figs 10-11, fig. 3n-o

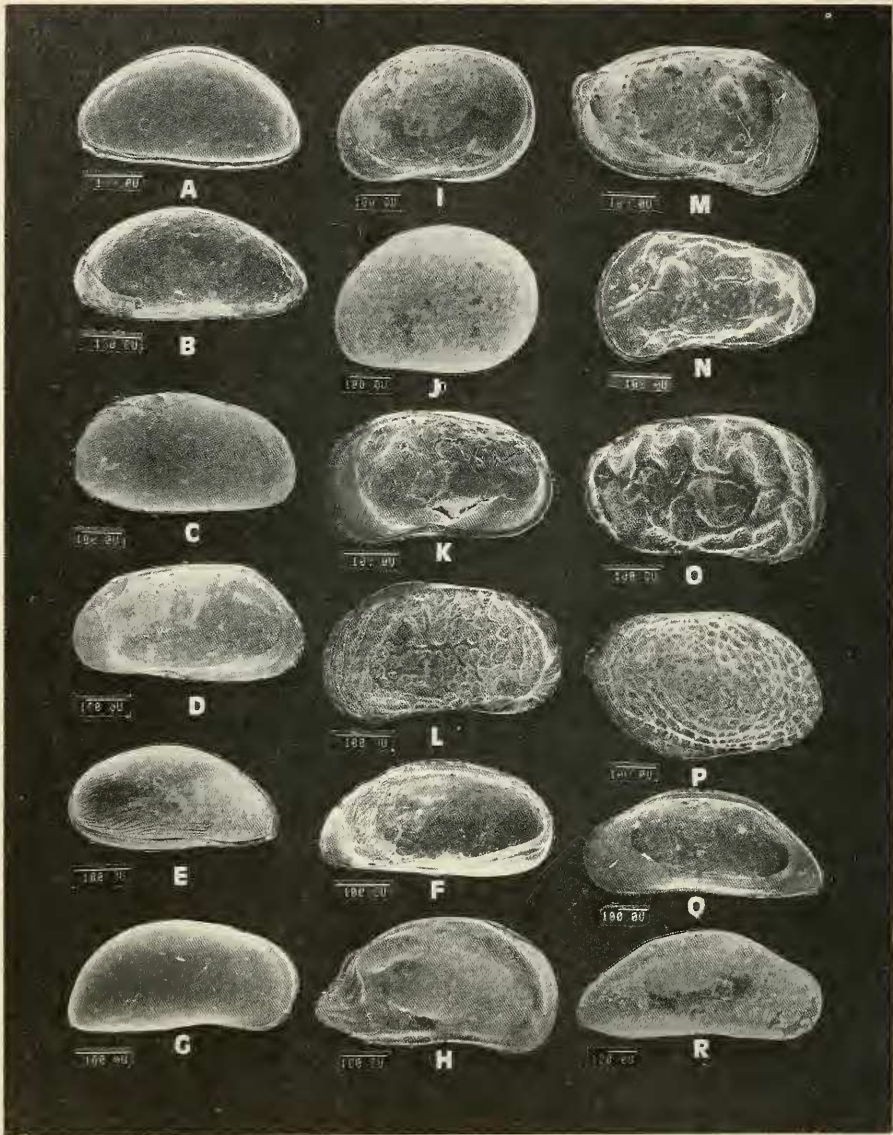


Fig. 7. A, B, *Paradoxostoma augustensis* Hartmann, 1979. A, LV external view; B, RV internal view. Sample 2, Port Hacking, South West Arm. C, D, *Paracytheroma sudaustralis* (McKenzie, 1978). C, RV external view; D, RV internal view. Sample 2, Port Hacking, Gunnamatta Bay. E, F, *Xestoleberis chilensis austrocontinentalis* Hartmann, 1978. E, RV external view; F, RV internal view. Sample 1, Port Hacking, Gunnamatta Bay. G, *Parakrithella australis* McKenzie, 1967. G, RV external view. Sample 1, Port Hacking, Gunnamatta Bay. H, *Caudites litusorienticola* Hartmann, 1981. H, RV external view. Sample 2, Port Hacking, Gunnamatta Bay. I, J, *Xestoleberis cedunaensis* Hartmann, 1980. I, RV internal view; J, LV external view. Sample 2, Port Hacking, Gunnamatta Bay. K, L, *Leptocythere hartmanni* (McKenzie, 1967). K, RV internal view; L, LV external view. Sample 2, Port Hacking, Gunnamatta Bay. M, N, *Callistocythere dorsotuberculata paucicostata* Yassini and Jones. M, LV internal view; N, LV external view. Sample 2, Port Hacking, Gunnamatta Bay. O, *Callistocythere puri* McKenzie, 1967. O, RV external view. Sample 2, Port Hacking, Gunnamatta Bay. P, *Loxoconcha australis* Brady, 1880. P, RV external view. Sample 2, Port Hacking, Gunnamatta Bay. Q, R, *Aglaiaella dietmarkeyseri* Hartmann, 1979. Q, RV internal view; R, RV external view. Sample 2, Port Hacking, Gunnamatta Bay.

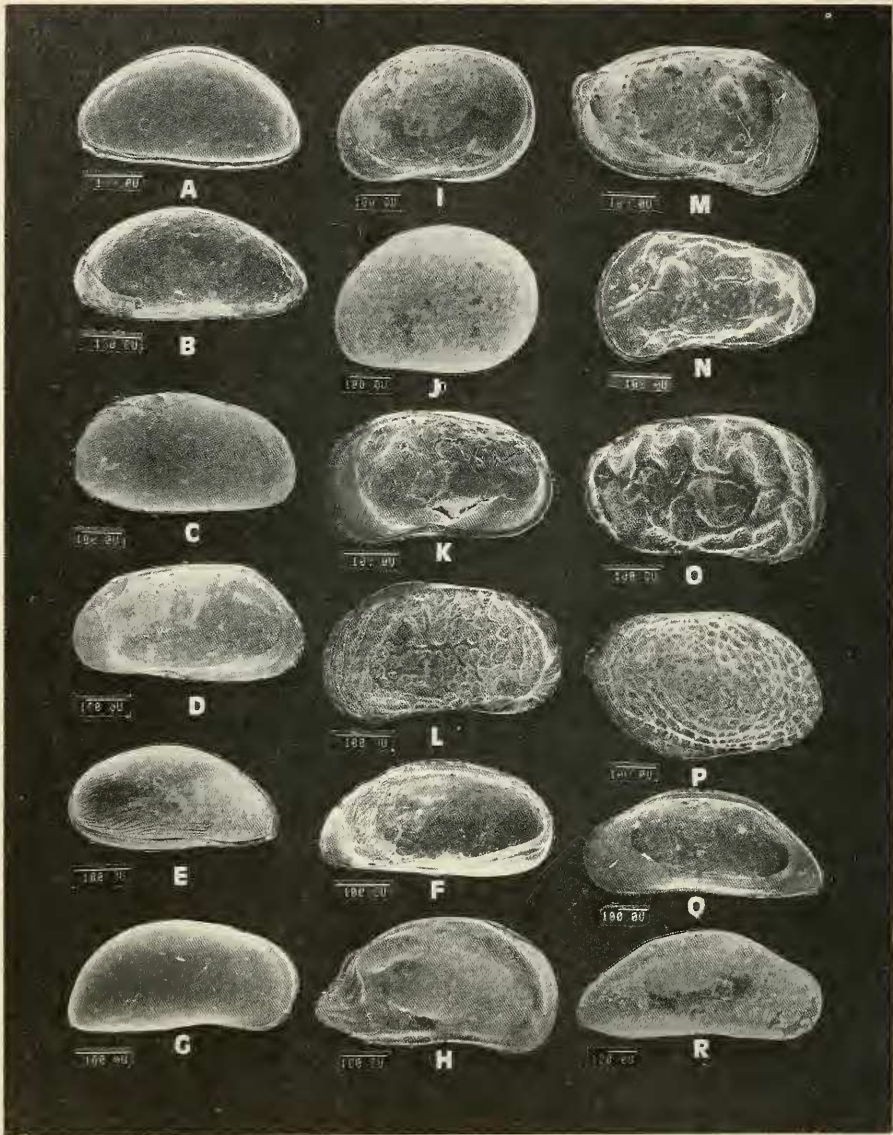


Fig. 7. A, B, *Paradoxostoma augustensis* Hartmann, 1979. A, LV external view; B, RV internal view. Sample 2, Port Hacking, South West Arm. C, D, *Paracytheroma sudaustralis* (McKenzie, 1978). C, RV external view; D, RV internal view. Sample 2, Port Hacking, Gunnamatta Bay. E, F, *Xestoleberis chilensis austrocontinentalis* Hartmann, 1978. E, RV external view; F, RV internal view. Sample 1, Port Hacking, Gunnamatta Bay. G, *Parakrithella australis* McKenzie, 1967. G, RV external view. Sample 1, Port Hacking, Gunnamatta Bay. H, *Caudites litusorienticola* Hartmann, 1981. H, RV external view. Sample 2, Port Hacking, Gunnamatta Bay. I, J, *Xestoleberis cedunaensis* Hartmann, 1980. I, RV internal view; J, LV external view. Sample 2, Port Hacking, Gunnamatta Bay. K, L, *Leptocythere hartmanni* (McKenzie, 1967). K, RV internal view; L, LV external view. Sample 2, Port Hacking, Gunnamatta Bay. M, N, *Callistocythere dorsotuberculata paucicostata* Yassini and Jones. M, LV internal view; N, LV external view. Sample 2, Port Hacking, Gunnamatta Bay. O, *Callistocythere puri* McKenzie, 1967. O, RV external view. Sample 2, Port Hacking, Gunnamatta Bay. P, *Loxoconcha australis* Brady, 1880. P, RV external view. Sample 2, Port Hacking, Gunnamatta Bay. Q, R, *Aglaiaella dietmarkeyseri* Hartmann, 1979. Q, RV internal view; R, RV external view. Sample 2, Port Hacking, Gunnamatta Bay.

Loxoconcha variolata Brady

(Fig. 5Q-S) (AM P36491)

1878 *Loxoconcha variolata* Brady, p.400, pl.18, fig. 4a-d1880 *Loxoconcha variolata*; Brady, p.121, pl.29, fig. 6a-dGenus *Loxoconchella* Triebel, 1954*Loxoconchella pulchra* McKenzie

(AM P36492)

1967 *Loxoconchella pulchra* McKenzie, p.88, fig. 4c1980 *Loxonchella* cf. *pulchra* McKenzie; Hartmann, p.140, pl.12, fig. 11984 *Loxonchella pulchra* McKenzie; McKenzie and Pickett, p.236, fig. 4A-BGenus *Hemicytheridea* Kingma, 1948*Hemicytheridea hiltoni* Yassini, sp.nov.

(Fig. 5A-F) (AM P36486-36487)

Derivation of name: for Mr Neville Hilton, chairman of the Lake Illawarra Management Committee*Holotype:* one right valve AM P36486*Paratypes:* 2 carapaces and one left valve AM P36487*Type Stratum:* Recent; sandy mud with *Posidonia australis**Type Locality:* Gunnamatta Bay, Port Hacking estuary*Dimensions:* Holotype length 225 μ ; width 115 μ Paratype length 205-230 μ ; width 100-115 μ *Description:* Carapace small elongate, subreniform; dorsal margin straight. Ventral margin slightly sinuous in anteroventral portion, anterior margin broadly rounded.

Posterior end subacute with distinct postero-dorsal cardinal angle. Inner lamella moderately wide at anterior end, narrows at posterior margin. Narrow vestibulum present at both margins. Marginal pore canals straight, about 20 at anterior margin and 11 at the posterior margin.

Surface of valve with strongly reticulate ornament, with prominent rib running obliquely from postero-median area to antero-ventral region. Two vertical ridges running from dorsal to ventral margin present at posterior end.

Wrinkled structure on surface of reticulation observed at high magnification. Sexual dimorphism present, the male being slightly longer and narrower than the female.

Remarks: Hinge structure and muscle scars are characteristic of *Hemicytheridea*. The species is close to *Hemicytheridea crenata* (Brady, 1890) but the latter mainly differs by having much more pronounced vertical ridges all over the surface of the valves.

Family PECTOCYTHERIDAE Hanai, 1957

Genus *Pectocythere* Hanai, 1957*Pectocythere portjacksonensis* (McKenzie)

(Fig. 6G-I) (AM P36498)

1967 '*Hemicytheridea*' *portjacksonensis* McKenzie, p.85, fig. 3i-j; pl.12, fig. 61980 '*Pectocythere*' *portjacksonensis* (McKenzie); Hartmann, p.122, pl.5, fig. 17*Pectocythere* sp. (Ceduna 120) Hartmann, 1980

(AM P36499)

1980 *Pectocythere* sp. (Ceduna 120) Hartmann, p.123, pl.3, figs 14-17

Loxoconcha variolata Brady

(Fig. 5Q-S) (AM P36491)

1878 *Loxoconcha variolata* Brady, p.400, pl.18, fig. 4a-d1880 *Loxoconcha variolata*; Brady, p.121, pl.29, fig. 6a-dGenus *Loxoconchella* Triebel, 1954*Loxoconchella pulchra* McKenzie

(AM P36492)

1967 *Loxoconchella pulchra* McKenzie, p.88, fig. 4c1980 *Loxonchella* cf. *pulchra* McKenzie; Hartmann, p.140, pl.12, fig. 11984 *Loxonchella pulchra* McKenzie; McKenzie and Pickett, p.236, fig. 4A-BGenus *Hemicytheridea* Kingma, 1948*Hemicytheridea hiltoni* Yassini, sp.nov.

(Fig. 5A-F) (AM P36486-36487)

Derivation of name: for Mr Neville Hilton, chairman of the Lake Illawarra Management Committee*Holotype:* one right valve AM P36486*Paratypes:* 2 carapaces and one left valve AM P36487*Type Stratum:* Recent; sandy mud with *Posidonia australis**Type Locality:* Gunnamatta Bay, Port Hacking estuary*Dimensions:* Holotype length 225 μ ; width 115 μ Paratype length 205-230 μ ; width 100-115 μ *Description:* Carapace small elongate, subreniform; dorsal margin straight. Ventral margin slightly sinuous in anteroventral portion, anterior margin broadly rounded.

Posterior end subacute with distinct postero-dorsal cardinal angle. Inner lamella moderately wide at anterior end, narrows at posterior margin. Narrow vestibulum present at both margins. Marginal pore canals straight, about 20 at anterior margin and 11 at the posterior margin.

Surface of valve with strongly reticulate ornament, with prominent rib running obliquely from postero-median area to antero-ventral region. Two vertical ridges running from dorsal to ventral margin present at posterior end.

Wrinkled structure on surface of reticulation observed at high magnification. Sexual dimorphism present, the male being slightly longer and narrower than the female.

Remarks: Hinge structure and muscle scars are characteristic of *Hemicytheridea*. The species is close to *Hemicytheridea crenata* (Brady, 1890) but the latter mainly differs by having much more pronounced vertical ridges all over the surface of the valves.

Family PECTOCYTHERIDAE Hanai, 1957

Genus *Pectocythere* Hanai, 1957*Pectocythere portjacksonensis* (McKenzie)

(Fig. 6G-I) (AM P36498)

1967 '*Hemicytheridea*' *portjacksonensis* McKenzie, p.85, fig. 3i-j; pl.12, fig. 61980 '*Pectocythere*' *portjacksonensis* (McKenzie); Hartmann, p.122, pl.5, fig. 17*Pectocythere* sp. (Ceduna 120) Hartmann, 1980

(AM P36499)

1980 *Pectocythere* sp. (Ceduna 120) Hartmann, p.123, pl.3, figs 14-17

Family CYTHERURIDAE Müller, 1894

Genus *Cytherura* Sars, 1866*Cytherura portuswelshpoolensis* Hartmann

(Fig. 6O-S) (AM P36484)

1980 *Cytherura portuswelshpoolensis* Hartmann, p.140, pl.12, figs 2-31981 *Cytherura portuswelshpoolensis* Hartmann, p.121

1984 Cytherurid sp.; McKenzie and Pickett, p.236, fig. 4E

Genus *Semicytherura* Wagner, 1957*Semicytherura illerti* Yassini, sp.nov.

(Fig. 6J-N) (AM P36502-36503)

Derivation of name: for Mr Chris Illert, who provided the samples for this study*Holotype:* a right valve of a male, AM P36502*Paratypes:* two carapaces and one left valve, AM P36503*Type Stratum:* Recent; sandy mud with *Posidonia australis**Type Locality:* South West Arm, Port Hacking estuary*Dimensions:* holotype length 170 μ ; width 182 μ paratype length 170-180 μ ; width 75-85 μ *Description:* Carapace medium size, elongate subrectangular, with subdorsal weakly developed caudal process. Dorsal margin straight, ventral margin slight sinuous in the middle. Anterior border well rounded in dorsal view.

Carapace is parallel-sided and acuminate at the extremities. Surface of valve with one prominent medio-dorsal longitudinal ridge and two or three medio-ventral ridges. Network of intercostal reticulation well developed at the anterior and posterior part of the valves. Intercostal area finely punctate. In ventral view four to five subparallel weakly developed ridges present. Eye tubercle prominent.

Inner lamella very wide both anteriorly and posteriorly, curving forward strongly in central part of valve.

Remarks: Such hinge structures and muscle scars are characteristic of *Semicytherura*. Sexual dimorphism is pronounced, the male carapace being much longer and narrower than the female.

Family XESTOLEBERIDIDAE

Genus *Xestoleberis* Sars, 1866*Xestoleberis cedunaensis* Hartmann

(Fig. 7I,J) (AM P36504)

1980 *Xestoleberis cedunaensis* Hartmann, p.149, pl.15, figs 1-41984 *Xestoleberis cedunaensis* Hartmann; McKenzie and Pickett, p.239, text-fig. 5Q-S*Xestoleberis chilensis austrocontinentalis* Hartmann

(Fig. 7E,F) (AM P36505)

1978 *Xestoleberis chilensis austrocontinentalis* Hartmann, p.128, figs 461-4641981 *Xestoleberis chilensis austrocontinentalis* Hartmann, p.122, pl.11, figs 1-12

Family PARADOXOSTOMIDAE Brady and Norman, 1889

Genus *Paradoxostoma* Fischer, 1855

Family CYTHERURIDAE Müller, 1894

Genus *Cytherura* Sars, 1866*Cytherura portuswelshpoolensis* Hartmann

(Fig. 6O-S) (AM P36484)

1980 *Cytherura portuswelshpoolensis* Hartmann, p.140, pl.12, figs 2-31981 *Cytherura portuswelshpoolensis* Hartmann, p.121

1984 Cytherurid sp.; McKenzie and Pickett, p.236, fig. 4E

Genus *Semicytherura* Wagner, 1957*Semicytherura illerti* Yassini, sp.nov.

(Fig. 6J-N) (AM P36502-36503)

Derivation of name: for Mr Chris Illert, who provided the samples for this study*Holotype:* a right valve of a male, AM P36502*Paratypes:* two carapaces and one left valve, AM P36503*Type Stratum:* Recent; sandy mud with *Posidonia australis**Type Locality:* South West Arm, Port Hacking estuary*Dimensions:* holotype length 170 μ ; width 182 μ paratype length 170-180 μ ; width 75-85 μ *Description:* Carapace medium size, elongate subrectangular, with subdorsal weakly developed caudal process. Dorsal margin straight, ventral margin slight sinuous in the middle. Anterior border well rounded in dorsal view.

Carapace is parallel-sided and acuminate at the extremities. Surface of valve with one prominent medio-dorsal longitudinal ridge and two or three medio-ventral ridges. Network of intercostal reticulation well developed at the anterior and posterior part of the valves. Intercostal area finely punctate. In ventral view four to five subparallel weakly developed ridges present. Eye tubercle prominent.

Inner lamella very wide both anteriorly and posteriorly, curving forward strongly in central part of valve.

Remarks: Such hinge structures and muscle scars are characteristic of *Semicytherura*. Sexual dimorphism is pronounced, the male carapace being much longer and narrower than the female.

Family XESTOLEBERIDIDAE

Genus *Xestoleberis* Sars, 1866*Xestoleberis cedunaensis* Hartmann

(Fig. 7I,J) (AM P36504)

1980 *Xestoleberis cedunaensis* Hartmann, p.149, pl.15, figs 1-41984 *Xestoleberis cedunaensis* Hartmann; McKenzie and Pickett, p.239, text-fig. 5Q-S*Xestoleberis chilensis austrocontinentalis* Hartmann

(Fig. 7E,F) (AM P36505)

1978 *Xestoleberis chilensis austrocontinentalis* Hartmann, p.128, figs 461-4641981 *Xestoleberis chilensis austrocontinentalis* Hartmann, p.122, pl.11, figs 1-12

Family PARADOXOSTOMIDAE Brady and Norman, 1889

Genus *Paradoxostoma* Fischer, 1855

Paradoxostoma augustensis Hartmann
(Fig. 7A,B) (AM P36496)

1979 *Paradoxostoma augustensis* Hartmann, p.261, text-figs 188-192

1980 *Paradoxostoma augustensis* Hartmann, p.157

Family CANDONIDAE Kaufmann, 1900
Genus *Aglaiella* Daday, 1910

Aglaiella dietmarkeyseri Hartmann
(Fig. 7Q,R) (AM P36477)

1979 *Aglaiella dietmarkeyseri* Hartmann, p.264, text-figs 241-250

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APPENDIX
LIST OF SPECIMENS

- 36476 *Actinocythereis* (*Ponticythereis*) *militaris*
 36477 *Agelaiella dietmarkeyseri*
 36478 *Bairdoppilata* sp.
 36479 *Callistocythere dorsotuberculata paucicostata*
 36480 *Callistocythere puri*
 36481 *Caudites litusorienticola*
 36482 *Cletocythereis rastromarginata*
 36483 *Actinocythereis* (*Ponticythereis*) *ichthyoderma*
 36484 *Cytherura portuswelshpoolensis*
 36485 *Echinocythereis melobesioides*
 36486 *Hemicytheridea hiltoni* (holotype)
 36487 *H. hiltoni* (paratypes)
 36488 '*Hiltermannicythere*' *bassiounii*
 36489 *Leptocythere hartmanni*
 36490 *Loxoconcha australis*
 36491 *L. variolata*
 36492 *Loxoconchella pulchra*
 36493 *Microcytherura aestuaricola*
 36494 *Osticythere baragwanathi*
 36495 *Paracytheroma sudaustralis*
 36496 *Paradoxostoma augustensis*
 36497 *Parakrihella australis*
 36498 *Pectocythere portjacksonensis*
 36499 *P.sp.* (Ceduna 120)
 36500 *Procythereis* (*Serratocythere*) *densuireticulata*
 36501 *P.(S.) kerguelenensis*
 36502 *Semicytherura illerti* (holotype)
 36503 *S. illerti* (paratypes)
 36504 *Xestoleberis cedunaensis*
 36505 *X. chilensis austrocontinentalis*

- , 1986. — A comparative study of collections from the S.W. Pacific (Saipan to Tonga), with the description of *Gambiella caudata* Brady, 1890) and new species of *Pterobairdia* (Ostracoda). *J. Micropaleont.* 5: 91-108.
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